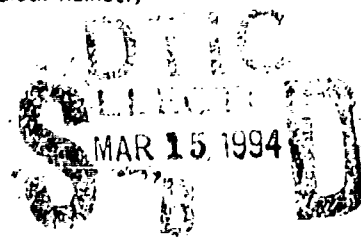




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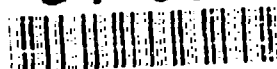
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ARMY SCOUT/RECONNAISSANCE HELICOPTERS

VERSUS

UNMANNED AERIAL VEHICLES

(A DUPLICATION OF EFFORT?)

"And Joshua, the son of Nun, sent out two men to spy
secretly saying, go view the land, even to Jericho."
Joshua, Chapter 2

PURPOSE

During the past couple of years, we have seen a dramatic change in the strategic threat to the United States with the collapse of the Soviet Union. Because of this change, the Department of Defense has reduced its spending and cut the force structure. For instance, the department's total budget will decline to its lowest level in almost 40 years from a high of 9 percent of the nation's gross national product (GNP) in 1952 to a projected low of 3 1/2 percent of the GNP in 1997.¹ Also, the number of people on active duty will decline as evidenced by the U.S. Army reducing its active divisions from 18 to 12 by the end of 1995.

The reduction of the budget and the cuts in manpower are only two of the problems the U.S. Army must contend with in the coming years. Another major problem will be how to modernize and equip the force to stay the world's leading army. Some examples of the materiel development areas that will compete for resources are deployability, battlefield identification systems and procedures, long-range accurate fire and smart munitions,

tactical mobility, reconnaissance, surveillance, and target acquisition capabilities.²

The purpose of this research project is to determine how best to meet future Army aerial scout/reconnaissance needs. I will briefly discuss the experience in the Persian Gulf War which helped identify present deficiencies and future requirements. In addition, I will examine some costs associated with each potential system and its organizational structure. Next, I will discuss some advantages and disadvantages of each system. Finally, I will provide recommendations on how the Army can best accomplish its reconnaissance mission.

BACKGROUND

What is reconnaissance and why is it important? As defined in Joint Chiefs of Staff Publication (JCS Pub) 1-02, Dictionary of Military and Associated Terms, reconnaissance is:

A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy; or to secure data concerning the meteorological, hydrographic or geographic characteristics of a particular area.³

In the February 1992 "Annual Report to the President and the Congress," the Secretary of Defense, Dick Cheney, details the importance of superior reconnaissance, surveillance, and target acquisition capabilities.

From the strategic to the tactical level, U.S. troops must be able to see the battlefield faster and more clearly than their opponents. U.S. forces will increase their reliance on theater and national intelligence-gathering capabilities and pursue advanced technologies to make timely and accurate intelligence information available to military commanders

both for targeting the enemy and for protecting friendly forces.⁴

This was critical during the recent Persian Gulf War.

EXPERIENCE IN THE PERSIAN GULF WAR

During Operations Desert Shield and Desert Storm, one success story was the intelligence capability of the coalition force, especially before the beginning of hostilities. However, after the fighting began, the tactical intelligence provided to the ground commanders was less than desired. Lieutenant General William M. Keys, USMC, commander of the 2nd Marine Division during Operation Desert Storm illustrated this point when he said, "At the strategic level, [intelligence] was fine. But, we did not get enough tactical intelligence - front-line battle intelligence."⁵

Although our forces experienced some problems in gathering information due to operational restrictions (deception and operational security),⁶ the information we did obtain at the tactical level by using the helicopter in reconnaissance missions proved invaluable to the outcome of the conflict. For example, during an armed reconnaissance mission, AH-1F helicopters from the 24th Infantry Division prevented an Iraqi convoy from crossing the Euphrates River by destroying the lead vehicle with a Tube-launched Optically-tracked Wire-guided (TOW) missile.⁷ Also, during poor weather, commanders used the AH-64 in armed reconnaissance missions to take advantage of the aircraft's tremendous night vision system and all weather capability.⁸

However, the helicopter that made the biggest contribution was the OH-58D. Its primary missions are "reconnaissance, intelligence gathering, surveillance and target acquisition and/or designation during day and night operations."⁹ The unique operational aspect of this helicopter is its mast mounted sight (MMS) which can provide day and night target acquisition and reconnaissance of the battlefield through a highly sophisticated, television-like system. Also, the pilot can use the MMS to designate targets for laser-guided weapons such as the Hellfire missile and the Copperhead artillery round.

During the conflict the Army used two different versions of the OH-58D - one armed and the other unarmed. The armed version helped the Navy in its maritime mission. Loaded with Hellfire missiles, 2.75" aerial rockets and a .50-caliber machine gun, these helicopters under the Navy's control attacked oil platforms and Iraqi forces on Qaruh Island.¹⁰

The Army used the unarmed version to perform traditional reconnaissance missions in cavalry and attack helicopter operations such as route reconnaissance and target designation. For instance, during the 100 hour ground campaign, OH-58Ds and AH-64s from the 11th Aviation Brigade, a VII Corps asset, attacked and destroyed many Iraqi tanks and armored personnel carriers. The OH-58D acquired and designated targets for the AH-64 which launched Hellfire missiles from maximum stand-off range.

Besides the use of manned aircraft, the coalition used

unmanned aerial vehicles (UAVs) with an unprecedented level of success in the reconnaissance and intelligence gathering roles. The Navy used UAVs for Naval gunfire support, battle damage assessment (BDA) and battlefield management."¹¹

The Marines deployed three companies and probably had the greatest success in using the UAVs. With the use of the "Pioneer" system in reconnaissance, surveillance, and target acquisition (RSTA) missions, the Marines gathered information about enemy targets. These targets included tanks, troop locations, artillery, aircraft hangars and other high priority targets. With naval gunfire and close air support, the Marines then engaged and destroyed most of the targets."¹²

The Army's only UAV platoon (a training platoon from Fort Huachuca, Arizona) proved invaluable to the VII Corps' operation. Once deployed, the corps used the Pioneer UAV system with outstanding results. As documented in the Department of Defense report to Congress, Conduct of the Persian Gulf War, "VII Corps was quick to recognize its value and began requesting more missions than the unit could fly."¹³

Another mission scenario in which the UAV proved its superior capability was in the area of BDA. In the end three services used the "Pioneer" system to find out the extent of damage after engaging targets. With its tremendous endurance, the UAV could stay on station for extended periods of time and take pictures from different angles. This proved to be of great value because it allowed the decisionmakers to immediately decid

if the targets needed to be attacked again.¹⁴

RECONNAISSANCE REQUIREMENTS AND DEFICIENCIES

Despite the limited success we had in Operations Desert Shield and Desert Storm, the U.S. Army still recognizes it has a significant battlefield deficiency in the area of reconnaissance. In the fluid battlefield of the future described in the Army's doctrine, reconnaissance at each level of command will be very important. Each level is responsible for a specific area of operation and concerned about a larger area of interest which impacts future operations. (See figure 1.)

Currently, there are few systems in the inventory that will meet the requirements at each level of command. For example, at the battalion level, the organic military intelligence (MI) resources can only see out about 10 km. These resources include a variety of systems such as the Ground Surveillance Radar (GSR) and the Remotely Monitored Battlefield Sensor System (REMBASS). The GSR can provide combat information and target acquisition by detecting and locating moving targets during limited visibility. However, REMBASS uses hand deployed sensors activated by magnetic, seismic, acoustic or infrared changes to detect moving targets.¹⁵

Another asset available at the division level is the long-range reconnaissance unit (LRSU). The LRSU can go approximately 50 km beyond the division's FLOT.¹⁵ However, there are several limitations with this type of unit such as the risks involved

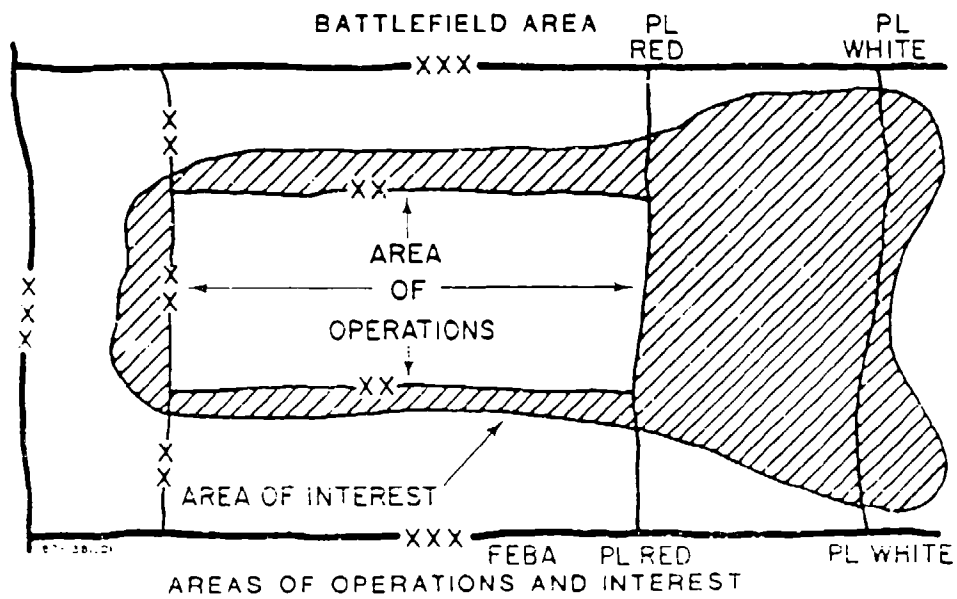
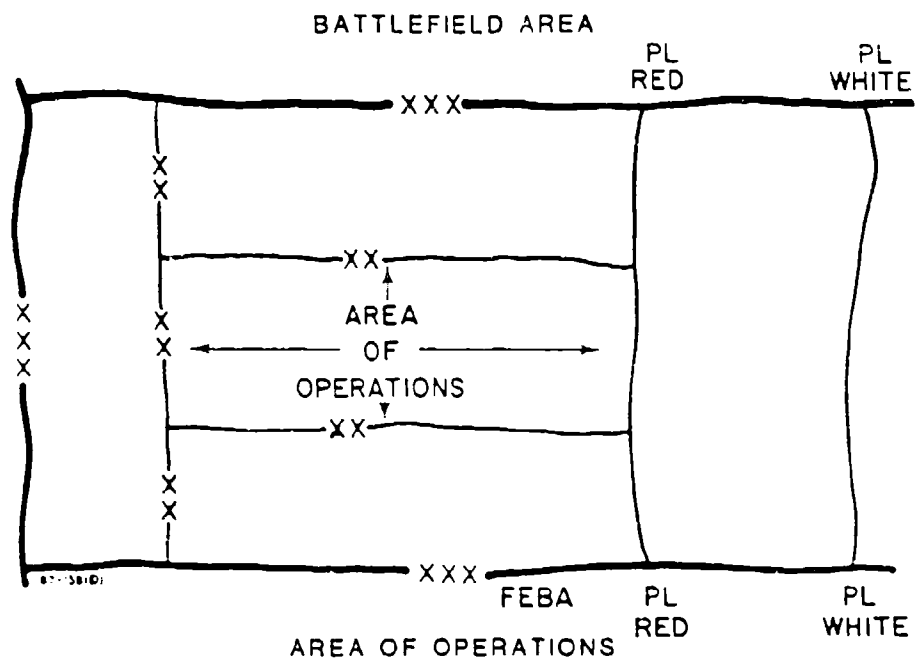


Figure 1

with deploying troops behind enemy lines, the lack of mobility and the difficulty involved in resupplying and retrieving the unit.

At the corps level there is a MI brigade that has tremendous reconnaissance capabilities due to the added capabilities of an aerial exploitation battalion (AEB). With its RC-12 aircraft, it can provide continuous around-the-clock collection of Communications Intelligence (COMINT), Signal Intelligence (SIGINT), and Electronic Intelligence (ELINT).¹⁷ The AEB also has the capability of providing photo and moving target indications with the OV-1D Mohawk. Currently, the Mohawks are being phased-out of the inventory in favor of the Joint Surveillance Target Attack Radar System (JSTARS).

Consequently, there is a significant shortfall in the ability to satisfy all reconnaissance requirements. The Army does not have the organic capability to have near real-time identification of high value targets such as artillery emplacements nor can it meet the requirement to gather and disseminate important information such as meteorological data in less than two hours.

What I have described above is the requirement for reconnaissance before and during a conflict in an unarmed reconnaissance mission. Of course, there is also a requirement for armed reconnaissance. As defined in JCS Pub 1-02, armed reconnaissance is:

A mission with the primary purpose of locating and attacking targets of opportunity, i.e. enemy materiel, personnel and

facilities, in assigned general areas or along assigned ground communications routes, and not for the purpose of attacking specific briefed targets.¹⁸

This reconnaissance type mission is best achieved by using either the ground or air cavalry.

Traditionally, a division's organic cavalry squadron performs the armed reconnaissance mission. At the corps level, the corps' armored cavalry regiment (ACR) performs the mission. One of their primary tasks is to find the enemy and fight him. Both units use air and ground assets to see and report battlefield conditions.

The ground assets include the M3 Bradley Fighting Vehicle and specially equipped High Mobility, Multipurpose Wheeled Vehicle (HMMWV or Hummvees). Air assets include the OH-58C (Kiowa) light observation helicopter and the AH-1F (Cobra) attack helicopter. There is one armored cavalry regiment (ACR) in Europe equipped with the new AH-64 (Apache) attack helicopter and the OH-58D (Kiowa) scout helicopter and, as mentioned earlier both helicopters performed superbly in the Persian Gulf War.

SCOUT/RECONNAISSANCE HELICOPTERS

In today's Army there are several helicopters that can do the reconnaissance mission. However, only a few are capable of performing the armed reconnaissance mission. As I previously alluded, the OH-58C and OH-58D are the primary unarmed reconnaissance helicopters. The recently fielded OH-58D is perhaps the best suited for the mission because of its many

capabilities such as low-light television, forward-looking infrared radar and Doppler navigation system. The OH-58C has none of these capabilities and relies solely on the night vision goggle equipped two-man crew for visual observation and navigation. Also, by the year 2000, the average OH-58C helicopter will be 30 years old.¹⁹

To solve one problem - lack of armament - the Army is modifying some of its OH-58D fleet. As results in the Persian Gulf War have shown, the armed version is a very lethal scout helicopter. A major drawback, however, is its marginal survivability due to inadequate ballistic protection.

The other two helicopters that can do the armed reconnaissance mission are the AH-1S and AH-64 helicopters. However, the AH-1S (Cobra) has limited night vision and no adverse weather capability.²⁰ Another drawback of the AH-1F is the large radar cross-section signature which makes it vulnerable to enemy air defense systems. Moreover, this helicopter is reaching the end of its service life. By the year 2000 the average fleet age will be 25 years.²¹

Although the AH-64 helicopter performed admirably in the Gulf War, it too is not the optimal system to perform the armed reconnaissance mission. Why? Its large radar cross-section signature limits its exposure time on the battlefield during a target engagement. It also has large acoustic, visual and infrared signatures.²² However, with the addition of the Longbow millimeter wave radar, the AH-64 will be able to "see" through

smoke and haze at standoff ranges. This will make it a superior attack helicopter, but it is still too large in the many ways discussed to hide effectively on the battlefield.

In the 1980's the Army realized its scout/reconnaissance helicopter fleet was becoming more vulnerable to enemy weapon systems. To overcome the shortcomings of large radar cross-section signatures, lack of ballistic protection, and limited offensive capability, the Army started developing a new generation reconnaissance helicopter. The result of this development effort is the RAH-66 Comanche.

The RAH-66 (Comanche) will be able to seek out and destroy enemy targets with its on-board weapons systems. In addition, it can designate targets for the AH-64, Air Force ground-attack aircraft, and field artillery. The design also includes improved stealth technology which will-greatly enhance the helicopter's survivability.²³

On a typical armed reconnaissance mission, the Comanche will be capable of attacking heavy armor targets with Hellfire missiles. In addition, the helicopter will carry antiaircraft Stinger missiles to protect itself from hostile aircraft. Also, the Comanche will have a 20-mm cannon for use against both air and ground targets.²⁴

The following table depicts a comparison of capabilities of each helicopter:

COMPARISON OF HELICOPTERS

	<u>OH-58C</u>	<u>OH-58D</u>	<u>AH-1S</u>	<u>AH-64</u>	<u>RAH-66</u> ²⁵
<u>DEPLOYMENT</u>					
Self	No	No	No	Yes	Yes
C-130	2	2	1	1	1
C-141	4	4	2	2	3
C-5	13	13	12	6	8
<u>EMPLOYMENT</u> ²⁶					
Endurance	3.0	3.0	2.5	1.8	2.5
Night/					
Adverse WX	Limit	Limit	Limit	Yes	Yes
TAS FLIR	No	Yes	No	Yes	Yes
Speed	90	110	120	145	177
NBC	MOPP4	MOPP4	MOPP4	MOPP4	OVERPRESS
<u>SUSTAINMENT</u>					
MMH/FH ²⁷	2.53	2.92	4.61	10.43	2.6
Cost/FH ²⁸	\$311	\$1425	\$1922	\$2789	\$704
<u>ARMAMENT</u>	None	HELLFIRE	TOW	HELLFIRE	HELLFIRE
		2.75"	2.75"	2.75"	2.75"
		.50 Cal	20mm	30mm	20mm

NOTE: Data for this table compiled from Table 5-18, FC 101-5-2, Staff Officers Handbook unless otherwise noted.

As you can see there are a variety of helicopters in the inventory or planned to be in the future to perform the armed reconnaissance mission. But is it necessary to perform this type of mission given the advances being made in electronic warfare and smart munitions? Some would argue it is not. These critics would rely solely on the use of unmanned aerial vehicles to paint the picture of the battlefield, designate the targets and then attack with either the helicopter or other weapon systems. So what can the unmanned aerial vehicle bring to the battlefield of tomorrow?

UNMANNED AERIAL VEHICLES

As the experience in the Persian Gulf war illustrates, one of the newest technologies available to the commander to "see" the battlefield is the unmanned aerial vehicle. In accordance with the 1988 Department of Defense Joint Unmanned Aerial Vehicle (UAV) Program Master Plan, four types of UAVs will be developed to meet the needs of the services. These are the close range, short range, medium range and endurance UAVs.²⁹ The following is a brief description of each:

- Close range: This category of UAV system is intended to satisfy the requirements of lower level tactical units and small ships, for a capability to investigate local area activities. . . . UAV systems in this category could be fielded in large numbers and therefore must be low in cost. In addition, such systems must be easy to launch, recover, and operate and require a minimum of manpower and training.
- Short range: Systems in this category are relatively low speed, moderate in cost and complexity, and provide medium to long endurance surveillance capabilities from low and medium altitudes . . . provide a capability for extended close surveillance of enemy activities from the FLOT or datum point out to 150 km . . . providing near real-time imagery of enemy activities. (Note: The Pioneer system is in this category.)
- Medium range: This category of UAV system responds to the Service requirements for a capability to conduct pre- and post-strike reconnaissance in support of strike operations by manned aircraft . . . provides a quick response capability to obtain the high quality imagery of heavily defended targets that is essential for the selection of specific targets and weapons for air strike operations.
- Endurance: Systems in this class of UAVs are characterized by longer times of flight than the systems in other categories . . . provide a demonstrated capability for extended surveillance of enemy activities that are not inherently range-limited.³⁰

The UAVs will carry a payload that can include either

imaging, jammer, target designator, NBC detection, communication relay, or meteorological sensors. There is no program to date to equip any of the UAVs with an offensive, attack and return to home station capability. The diagram at figure 2 illustrates the UAV requirement categories to include the endurance and radius of action.

DOD NONLETHAL UAV REQUIREMENTS CATEGORIES

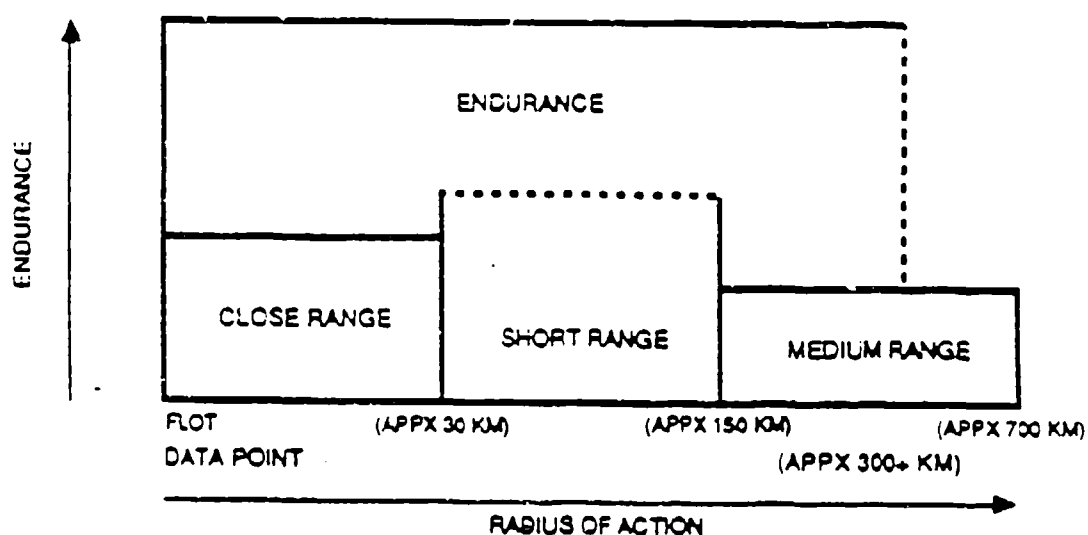


Figure 2³¹

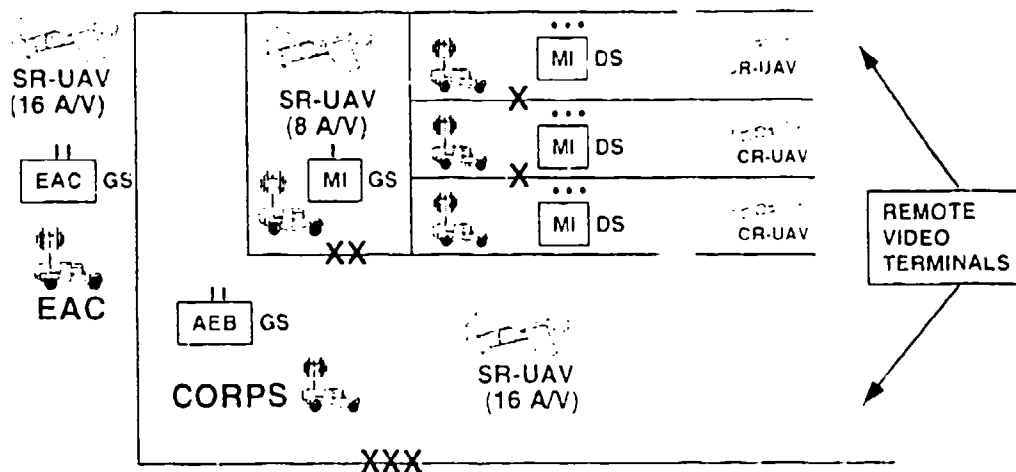
Currently, the Army is focusing on the short range system. As previously mentioned, VII Corps took advantage of the only UAV platoon in the Army during Operation Desert Storm. Based on earlier efforts and this experience, the Army developed a proposed Organizational and Operational (O&O) concept. Under this concept, the MI battalion in each division would have one organic UAV company. This company would have eight aerial vehicles, four ground control stations, and approximately 60

personnel that could provide direct support across the division. Conceptually, each maneuver brigade in the division would have a UAV platoon attached to it for direct support.³²

At the corps level, a UAV company with sixteen aerial vehicles and four ground control stations would be available to provide general support to the corps. This unit will be assigned to the aerial exploitation battalion.³³

Operationally, the UAVs will be under centralized launch and recovery control of the corps or division depending upon the location of the unit. However, the division or brigade will have decentralized command and control authority. The ground control stations which are the brains of the operation will be at the major command and control elements.

The following diagram depicts the layout of the proposed C³I concept:



- CENTRALIZED LAUNCH / RECOVERY - CORPS / DIV
- DECENTRALIZED COMMAND AND CONTROL - DIV / BDE
- REMOTE VIDEO TERMINAL - LOCATED AT MAJOR C³I ELEMENTS

Figure 3

Now that we have an idea of the capabilities of each system, let's look at some advantages and disadvantages.

ADVANTAGES/DISADVANTAGES OF HELICOPTERS

The advantages of a reconnaissance helicopter on today's modern, fluid battlefield are significant. A helicopter gives the commander a quick response intelligence asset to respond to just about any enemy threat. These advantages were demonstrated during the Persian Gulf War as reported in the Department of Defense Report to Congress.

Attack, scout, and special operations aircraft performed repetitive armed reconnaissance missions in each division zone for days before the ground offensive. Even with the array of deep acquisition platforms, one of the most reliable and timely sources of battlefield information for tactical commanders was human source intelligence (HUMINT) provided by aviation.³⁴

Another advantage is the capability to see the enemy at night with low-light television, forward-looking infrared radar and direct-view optics. If the purpose of the mission is to not engage the enemy but just to report his location, the standoff range of the helicopter allows the commander to cover a wide area in a short amount of time. Finally, one of the major advantages is to add the human element to the reconnaissance equation by having "eyes" on the target.

However, along with the advantages are some significant disadvantages. Given that one purpose of a reconnaissance mission is to find the enemy and report his location means a helicopter with its crew must be exposed to determine this

information. Under certain circumstances the exposure of the crew to the enemy radar threat may result in detection and therefore destruction of the helicopter and crew.

Also, the helicopter is not a maintenance, logistic-free piece of equipment as shown on a previous chart. Although there have been tremendous improvements in this area, the fact remains the helicopter requires significant manpower and materiel support to keep it flying.

Weather can also have a negative impact on helicopter operations. For example, blowing sand, snow or rain can make visual contact of the enemy virtually impossible. Not only does this decrease the effectiveness of the helicopter but it also increases the probability of losing the crew and aircraft due to accidents.

ADVANTAGES/DISADVANTAGES OF UAVs

Just as the helicopter provides unique advantages, so too does the UAV. First and perhaps most important is the increased survivability due to reduced radar signatures. Both the close and short range UAVs are significantly smaller than current helicopters and fixed wing aircraft performing similar missions. Thus their probability of detection by enemy radar is reduced. Moreover, there is no potential injury, death or crew capture.

Second, the acquisition cost of a UAV is much lower than any manned aircraft system. For example, the estimated procurement cost for a short-range UAV system is approximately

\$2.7 million which includes the air vehicle and all the support equipment. However, the replacement costs for the air vehicle to include the mission package is approximately \$1.1 million. This is a sharp contrast to the procurement cost of an AH-64 which is about \$15 million and that of the new RAH-66 which is estimated to be about \$8.5 million. This does not count the cost of training or replacing new aircrew members.

A third major advantage is the lower operations and support costs. As shown in the previous "Comparison of Helicopters" chart the cost per flying hour can range from a low of \$263 per hour for the OH-58C to a high of \$2,574 for the AH-64. The estimated cost for a short-range UAV is approximately \$749 per hour.

On the personnel side of the equation, the UAV definitely enjoys a unique advantage. For example, in the mid-1970s it took over 90 people to fly and maintain one UAV system at a sortie rate of two per day. Today, it takes only 16 people to sustain a similar rate.³⁵

Another major advantage of the UAV is its flight endurance. Some UAV systems can stay aloft as long as six to twelve hours which is a significant advantage over the use of manned systems. UAVs do not need the rest that aerial crews do. Long missions increase flight hour utilization compared to helicopters. Therefore, the UAV can perform more sorties per day than a helicopter.

However, there are some disadvantages with relying solely on

the UAV. The primary disadvantage is the fact the UAV has no armed reconnaissance capability. When the UAV is operating on a reconnaissance mission, another system such as field artillery, close-air support aircraft or attack helicopters must be used to attack a target. Time delays involved in getting "steel on the target," may prove disastrous if the enemy is about to launch a major attack in a previously unsuspected area.

Weather can also be a disadvantage to operating UAVs. This is especially true in cloudy, overcast conditions because the normal operating altitude is between 3000-6000 feet above the ground. While the helicopter can operate literally a few feet of the ground, the UAV normally requires line-of-sight contact with the ground controller. Thus, it must operate at altitude and may not be able to "see" through cloud layers. However, with the future radar and infrared technology, this may cease to be a problem.

CONCLUSIONS AND RECOMMENDATIONS

Each system has unique capabilities that it can bring to the modern battlefield as we learned in the Persian Gulf War. However, neither system is fully capable of performing both the unarmed and armed reconnaissance missions without some degree of risk. For example, a helicopter on an unarmed mission is expensive to operate and maintain, whereas the UAV can perform the same mission at less cost and risk to both personnel and equipment.

On an armed mission, the situation may dictate otherwise. For instance, if the immediate destruction or suppression of an enemy target is the object, then the armed helicopter is probably the best weapon system for the mission if the systems are used exclusive of one another. This assumes, however, there is no UAV with an armed reconnaissance capability or that UAVs are not supported by armed helicopters or other weapons systems. In the next ten to fifteen years, given the advances in technology in electronics, lasers, sensors communication data links and global positioning systems, it is feasible to comprehend that UAVs could actually perform an armed reconnaissance mission. However, with current technology the helicopter is still the best weapon system for the mission. Furthermore, if validation of data by visual means is key to the success of the mission, then the helicopter is more suited for the mission according to Major General Rudolph Ostovich III, former commander of the U.S. Army Aviation Center.³⁶

Consequently, I would leave the armed reconnaissance mission to the aviation world at this point. We shouldn't waste the time and effort to try to develop a close or short-range lethal UAV during the current budget crisis. Therefore we should leave the target destruction mission to the air and ground cavalry unit or attack helicopter battalions in the close-in battle.

However, to assist the aviation world, I would recommend assigning a UAV platoon to the division's aviation brigade. Why? The aviation brigade operates throughout the area of operations

with a variety of helicopters. Although some aircraft provide command and control support and others provide lift support, the major thrust is toward attack operations. This is where a UAV platoon would be most valuable.

For example, let's assume the aviation brigade receives a mission to go across the FLOT to attack the second echelon of an enemy formation or to perform a raid. The UAVs could provide the necessary reconnaissance and immediately relay targeting information to the planning headquarters. The attack helicopter crews could then update their onboard computers and be confident in accomplishing the mission.

The UAVs could also fly ahead of the attack helicopters during the movement to the target area and be decoys by using onboard system to emit signals. Although some may be lost, it would be better to lose a UAV than to lose an expensive helicopter and crew. This is not a new idea. The Israelis used similar tactics when they attacked the Syrians in the Bekaa Valley in 1982.³⁷

The major advantage of using both systems together would be something similar to a hi-low mix. The UAVs could fly above the assigned reconnaissance area and relay targeting information to the helicopters via data links. The reconnaissance/attack helicopters could then launch missiles or attack the targets with their 20mm cannon. This concept would negate the need for the "traditional" hunter-killer teams where the unarmed scout/observation helicopter seeks out the enemy target which is

then destroyed by the attack helicopter.

Therefore, I would recommend the Army retire all the unarmed reconnaissance helicopters before the end of the century. As COL Charles B. Cook wrote in his study project for the Army War College, this should also apply immediately to the National Guard because the current fleet of OH-6 (these are only found in the National Guard) and OH-58 helicopters are nothing more than manned drones.³⁸

In the next few years, the Department of Defense will face tremendous fiscal and personnel challenges. It is therefore imperative that we allocate the funds and people we receive in the best possible manner to achieve the biggest payoff for each dollar spent. As indicated by the senior leaders in the Department of Defense, the time has come when we need to take a hard look at the roles, missions and functions of our services. There is no better time than now to do a complete scrub across all mission areas to take advantage of the technology at hand.

In each of the material development areas this means continuing to develop the systems that are most capable of performing the mission. In the reconnaissance area the major focus should be in the development of the new RAH-66 and UAVs. The development and fielding of these systems will ensure we continue to have the best possible equipment for our fighting forces to win on the battlefield of the future.

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